

Colchester: the scow "Gorman" was capsized during the storm (low area i.) of the 2d.

Belleville: the steam barge "Varcina" was struck by a violent squall (low area i.) on the 2d, while passing up Big bay, and had her life-boats washed away.

Tennessee.—Chattanooga: on the 2d a violent storm passed over Lookout mountain, near Sulphur Springs, Alabama, and about thirty miles south of Chattanooga. The track of the storm was about four hundred yards wide and everything in its course was destroyed. On the 24th a severe hail storm occurred at Boyce station, five miles northeast of Chattanooga. The storm began at 7 p. m. and continued for ten minutes; much damage was done to the fruit crop.

Texas.—Dallas, Dallas county: a violent storm prevailed at this place during the night of the 20-21st. The wind blew with a force sufficient to prostrate trees and fencing. The rainfall was remarkably heavy and flooded the lowlands. Of ten trains due at this place on the 21st, only one arrived.

Marshall, Harrison county, 5th: the recent heavy rains have been the most destructive to crops that have ever occurred in this section. Many farmers will have to replant their entire crops.

Hempstead, Waller county: on the morning of the 21st, a destructive tornado passed through this county near Howth's station. A house, within which were five persons, was blown down and one of the inmates killed.

Mexia, Limestone county: a storm of considerable force passed over the northeastern part of this town at 8 p. m. of the 21st. Reports state that a tornado occurred at about noon of the 20th between Fairfield and Stewartsville, in Freestone county.

El Paso: at 12.36 p. m. of the 27th a violent whirl-wind passed over this town, carrying with it a column of sand more than one hundred feet high. The diameter of the whirl was apparently from ten to fifteen feet, and its rotary motion from right to left. Its path was almost in a direct line from west-south-west to east-northeast, and in the vortex many light objects were carried to a height of about eighty feet. When the whirl-wind reached a large shed in its course it became stationary for a short interval; the rotary motion increased in violence, tearing off a part of the sheet-iron roof and hurling it some distance. Several plates of sheet-iron of from seventy five to one hundred square feet of surface were taken upward to a height of forty feet and carried a distance of one hundred feet. No unusual change was noted in the meteorological instruments during the passage of the whirl-wind.

Fort Stockton: during the early morning of the 30th a severe storm passed over this place, blowing down signs etc.

Vermont.—Burlington: one of the severest storms (low area i.) experienced here for many years occurred on the afternoon of the 2d. The water in Lake Champlain was very high, and during the storm 1,100 feet of the breakwater were torn away, entailing a loss of \$35,000. The wharves were also damaged to the extent of \$5,000.

Wisconsin.—Milwaukee: the storm (low area i.) of the 2d was reported by vessels arriving at this port to have been very severe on Lake Michigan. The wind blew with the force of a strong gale and was accompanied by heavy snow, sleet, and rain. A ship-captain stated that at one time the decks of his vessel were covered with six inches of snow. Numerous disasters occurred on the lake during the storm.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The Ohio, Missouri and upper Mississippi rivers were low throughout the month. In the lower Mississippi the water continued to fall slowly, the decline for the month being three feet and nine inches at Vicksburg, Mississippi, and six inches at New Orleans, Louisiana.

The Red river at Shreveport, Louisiana, reached a very high stage on the 14th, at which time it was nearly three feet above

the danger-line, and one inch above the flood-mark of February, 27, 1884.

The Cumberland river reached a very low stage during the latter part of the month: The observer at Nashville, Tennessee, reports that navigation was partially suspended on the 28th, on account of low water. During the last three years navigation in the Cumberland has continued until July, and last year the river was navigable until the latter part of August. At the close of May, 1884, only boats of light draft were able to make trips.

In the following table are shown the danger points at the various river stations; the highest and lowest stages for May, 1884, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, May, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>	<i>Ft. In.</i>		<i>Ft. In.</i>		<i>Ft. In.</i>	<i>Ft. In.</i>
Shreveport, Louisiana.....	29 9	14	32 8	1	21 1	11 7
<i>Arkansas:</i>						
Little Rock, Arkansas.....	33 0	16	23 9	31	9 3	14 6
Fort Smith, Arkansas.....		4	10 3	31	0 2	10 1
<i>Missouri:</i>						
Yankton, Dakota.....	20 0	31	10 8	20, 21, 25	6 0	4 8
Omaha, Nebraska.....	16 0	31	8 11	21 to 24	7 0	1 11
Leavenworth, Kansas.....	21 0	31	13 5	22	10 2	3 3
<i>Mississippi:</i>						
Saint Paul, Minnesota.....	14 6	5, 6, 7	10 3	22	6 11	3 4
La Crosse, Wisconsin.....	18 0	11, 12	8 1	3, 5	5 9	2 4
Dubuque, Iowa.....	21 10	16	11 6	31	9 2	2 4
Davenport, Iowa.....	15 0	4, 19	8 10	31	6 10	2 0
Keokuk, Iowa.....	14 6	8, 9	10 4	31	7 9	2 7
Saint Louis, Missouri.....	30 0	7	25 2	28	17 4	7 10
Cairo, Illinois.....	40 0	9	38 5	31	21 4	17 1
Memphis, Tennessee.....	34 0					
Vicksburg, Mississippi.....	41 0	6 to 9	45 9	31	42 0	3 9
New Orleans, Louisiana *.....	—2 6	14, 15	—1 5	1	—1 11	0 6
<i>Ohio:</i>						
Pittsburg, Pennsylvania.....	20 0	16	7 0	4	2 9	4 3
Cincinnati, Ohio.....	50 0	16	22 5	31	12 7	9 10
Louisville, Kentucky.....	24 0	1	9 5	31	6 10	2 7
<i>Cumberland:</i>						
Nashville, Tennessee.....	42 0	1	16 11	31	3 7	13 4
<i>Tennessee:</i>						
Chattanooga, Tennessee.....	33 0	7	11 5	31	4 3	7 1
<i>Monongahela:</i>						
Pittsburg, Pennsylvania.....	29 0	16	7 0	4	2 9	4 3
<i>Savannah:</i>						
Augusta, Georgia.....		7	9 10	31	6 8	3 2
<i>Willamette:</i>						
Portland, Oregon.....		31	18 5	4	8 11	9 6
<i>Sacramento:</i>						
Red Bluff, California.....		1	5 10	31	3 2	2 8
Sacramento, California.....		1	22 10	31	22 0	0 10
<i>Mobile:</i>						
Mobile, Alabama.....		27	17 0	18	15 9	1 3
<i>Colorado:</i>						
Yuma, Arizona.....		31	26 2	1	18 8	7 6

* Below high-water mark of 1874 and 1883.

ICE IN RIVERS AND HARBORS.

Lake Superior.—Marquette, Michigan: harbor full of ice on 5th; ice moved out of harbor on 6th; ice in harbor on 21st and 31st.

Duluth, Minnesota: the ice was driven out of the harbor by westerly winds on the 1st, when navigation was resumed; the propeller "Osceola," left for Buffalo, being the first departure of the season; the harbor was covered with ice on the 4th; the first arrival of the season occurred on the 9th; there were large quantities of ice in the lake on the 12th and 13th; the lake was clear of ice on the 14th.

Minne-waukan, or Devil's lake.—Fort Totten, Dakota: the ice in the lake was gradually disappearing on the 6th; on the 11th, the lake was free of ice and navigation was resumed on that date.

Yellowstone River.—Fort Assinaboine, Montana: navigation open; first boat of the season arrived on the 4th.

FLOODS.

The floods which occurred during May were of local character and were confined to the smaller rivers and streams; they were most destructive in Texas, where a large amount of damage was done. The reports from the various states are as follows:

Arkansas.—Little Rock: on the 6th the streams in this vicinity were much swollen. Reports from points above this

city on the Arkansas river on that date stated that the water had nearly reached the greatest height of the recent flood marks. The Texas and Pacific railroad was badly damaged between Pine Bluff and Texarkana, and the running of trains to Camden, on the Iron mountain branch, was discontinued.

Helena: the heavy rains of the 5th and for several days preceding that date flooded the surrounding country to such an extent that farming operations were abandoned.

California.—Merced, Merced county, 20th: the melting of the winter's snowfall has caused all streams in this vicinity to overflow.

Colorado.—Denver: reports received at this place on the 31st stated that on the 29th a cattle "round-up" camp on Frenchman creek in Nebraska, near the line dividing that state and Colorado, had been destroyed by a flood, and that eleven of fifty herdsmen, encamped at that place, were drowned. During the evening of the last-mentioned date the creek rose rapidly, but no danger was apprehended. It is thought that a "cloud-burst" occurred about midnight at some distance up the creek, which caused it to overflow, when the water suddenly rushed down upon the camp, sweeping away the men, animals, and wagons. The flood soon began to recede and at daylight, the water had fallen to its usual height. The banks of the stream, for miles, were strewn with fragments of wagons, tents, etc.

Idaho.—Boisé City: the bridge over the Boisé river was damaged to the extent of \$1,000 by the high stage of water on the 11th.

Louisiana.—Shreveport: on the 12th several large plantations in this region were overflowed. On the 14th the Red river was thirty-two feet, eight inches above low water mark. This stage is one inch higher than the maximum height of February 27th, 1884, and is said to be the highest point attained since 1849. The Signal Service observer at Shreveport reports that the acreage under cultivation is greater than for any previous year, and that this flood will prove by far the most destructive that has ever occurred in this region. Should the river now recede in time to permit cotton planting, great difficulty would be experienced in procuring the seed.

Mississippi.—Vicksburg: on the 9th, the steamer "City of Vicksburg" brought about two hundred laborers from the overflowed farms in Tensas parish, Louisiana. On this date it was estimated that sixty per cent. of the area of Madison parish and seventy per cent of Tensas parish were still under water.

Missouri.—Pierce city, Lawrence county: very heavy rains fell during the night of the 12-13th, flooding the creeks in this vicinity. The eastern part of the town was under water, and the railroad bridge, with about three hundred yards of the track on either side, was washed away.

Lexington, La Fayette county: reports from the surrounding country on the 18th stated that the rainfall on the afternoon of the 17th was the heaviest known for several years. The creeks were much swollen, Tabo creek having risen six feet in two hours. The Missouri Pacific railroad track was washed out, causing delay of trains.

Carthage, Jasper county: the heaviest rainfall of the season occurred during the night of 12-13th. All of the neighboring streams were much swollen and the lowlands were flooded. Trains were delayed on account of washouts on the railroads.

Nebraska.—Omaha: in Platte county, on the afternoon of the 5th, a violent hail storm occurred, which was followed by a remarkably heavy rainfall. It is reported that in three hours ten inches of rain fell, which flooded the country. The town of Columbus was completely isolated for three days, and a serious washout occurred on the railroad both east and west of Columbus. Nine miles north of Columbus two school children were caught in the storm and drowned. A mill on Lost creek was destroyed and a large number of cattle were drowned.

Humphrey, Platte county: the storm of the 5th, which passed ten miles south of this place, was one of unusual severity and was accompanied by a phenomenal rainfall. The water in Shell creek rose to the tops of the trees along its banks.

Much property was destroyed and many head of cattle were drowned.

Genoa, Vance county: on the afternoon of the 5th, at about eight or ten miles northeast of this station, a "cloud-burst" occurred which drowned stock, washed away railroad tracks and bridges, and flooded the country for miles in extent.

Texas.—Galveston: reports from all portions of the state show the rains of the 20th and 21st, to have been the heaviest ever known in Texas, and that the damage to agricultural interests was very great. Travel on all railroads in eastern Texas was suspended on account of injury to the road beds and the washing away of bridges. Reports from Tyler, Marlin, Navasota, Crockett, Waverly, and other points in northeastern Texas, state that the heavy rains of the 21st flooded that region to a greater extent than has been known for many years. At Weatherford more than eight inches of rain fell; at Corsicana, five inches; at Dallas, Palestine, and Tyler, four inches. The north bound train on the International and Great Northern railroad, which left Galveston on the evening of the 21st, after passing Houston, was compelled to return on account of dangerous washouts in the road near Palestine. The overflowing of the Sabine river inundated many plantations in the adjacent lowlands. Reports from Waco on the 21st stated that the Brazos river reached the highest point that has been known for thirty years, and that a number of dwellings were surrounded by water compelling their occupants to abandon them. At Marlin, on the Brazos, many families were compelled to move out of their houses. On the 23d it was estimated that the actual damage to railroad property by the heavy rains of the 20th and 21st would be \$2,000,000, and the combined losses sustained by farmers and railroad companies would reach \$5,000,000. Hundreds of culverts and small bridges were washed away. Owing to the general suspension of railroad traffic, large quantities of freight accumulated at points along the several roads. A heavy rain storm set in on the night of the 24-25th. On the 26th reports from various parts of the state showed that washouts had occurred on all Texas railroads. The eastern approach of the Bremond narrow-gauge railroad bridge across the San Jacinto river was washed away, and the whole country in that vicinity was under water. Large numbers of cattle were drowned and the inhabitants were driven to the highlands.

Fort Worth, Tarrant county, 21st: the heavy rains of the past few days caused the streams in this vicinity to rise rapidly. The Trinity river overflowed on the 21st, inundating the bottom lands for a mile on either side of the river and washing away a number of small cabins. The water in Trinity river rose to a greater height than has been known since 1866. The overflow has damaged crops to a great extent. Railroad travel was seriously interrupted and much stock was drowned.

Corsicana: on the 23d, Chambers creek was one and one-half miles in width, and many of the farmers along its banks sustained heavy losses. Seven bridges, belonging to the county were washed away, entailing a loss of about \$6,000.

Jefferson, Marion county, 23d: the heavy rains of the past few days have caused the streams to rise rapidly. Travel on both the Texas Pacific and Red river railroads was suspended on account of high water.

The Signal Service observer at El Paso, Texas, reports the following: "about the 10th, the Rio Grande river began to rise rapidly and latterly reached an unprecedented height, submerging the lowlands in the Rio Grande valley, and causing loss of life and great damage to property. Railroad travel north and east was seriously interfered with by washouts. At the close of the month the Southern Pacific railroad, southeast of El Paso, was in some places covered with water to a depth of three feet."

Rio Grande City: the rise in the Rio Grande river reached this place on the 26th, when the banks on the Texas side of the river began to give way.

Utah.—Salt Lake City, 31st: the rivers throughout the ter-

ritory have been much swollen during the month. At the close of the month the lowlands in the southern part of this city were flooded. At Ogden several dams were swept away, entailing losses estimated at \$6,000. Numerous washouts occurred on the Union Pacific railroad. The Denver and Rio Grande railroad in southeastern Utah was flooded and no trains from Denver arrived after the 28th. The water in Great Salt Lake reached a greater height than has been known for many years.

Nephi, Juab county: the railroad bridge at the forks of Salt creek was washed away on the 9th.

West Virginia.—Wheeling: on the 13th the southeastern part of Jackson county, in this state, was visited by a severe storm which caused heavy losses to the farmers along the creek bottoms. Several dwellings and bridges and numerous barns are reported to have been washed away. The orchards and newly planted fields were also seriously damaged.

RAIN FROM A CLOUDLESS SKY.

Key West, Florida: from 9.45 to 10 p. m. of the 28th, a light rain fell when no cloud was visible except near the western horizon.

HIGH TIDES.

Eastport, Maine: 11th and 27th.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for May, 1884, with the telegraphic reports of the preceding twenty-four hours, shows the general average percentage of verifications to be 81.54 per cent. The percentages for the four elements are: Weather, 87.43; direction of the wind, 75.81; temperature, 79.52; barometer, 86.22 per cent. By geographical districts, they are: For New England, 79.66; middle Atlantic states, 84.35; south Atlantic states, 84.25; eastern Gulf, 83.93; western Gulf, 84.90; lower lakes, 79.92; upper lakes, 78.04; Ohio valley and Tennessee, 81.80; upper Mississippi valley, 78.35; Missouri valley, 78.65; north Pacific, 86.29; middle Pacific, 87.10; south Pacific, 89.52. There were three omissions to predict out of 3,137, or 0.09 per cent. Of the 3,134 predictions that have been made, seventy-eight, or 2.49 per cent., are considered to have entirely failed; one hundred and fifty-two, or 4.85 per cent., were one-fourth verified; four hundred and thirty-six, or 13.91 per cent., were one-half verified; six hundred and seventy-four, or 21.51 per cent., were three-fourths verified; 1,794, or 57.24 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During May, 1884, two hundred and sixty-six cautionary signals were ordered. Of these, one hundred and ninety-seven, or 74.06 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Fifty-eight cautionary off-shore signals were ordered, of which number forty-six, or 79.31 per cent., were fully justified, both as to direction and velocity; forty-eight, or 82.76 per cent., were justified as to velocity; and forty-nine, or 84.48 per cent., were justified as to direction. Three hundred and twenty-four signals of all kinds were ordered, two hundred and forty-three, or 75.0 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, fifty-four were changed from cautionary; no northwest signals were ordered. Five signals were ordered late. In eighty-seven cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

Prof. T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for May, 1884, makes the following statement:

In the matter of railway weather signals the percentage of verification for the month is: for temperature, 93; and for state of the weather, 78, the mean being 85.5. For May of last year the percentage of verification was reported as 75, and a gain of more than 10 per cent. is shown.

Arrangements are now nearly completed for placing the system of car signals upon the two divisions of the Hocking Valley and Columbus and Toledo Railway. It is expected to have the system in successful operation before the end of June, and efforts will be continued to secure permission to place the signals on the cars of other lines of railway.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during May, 1884, with the average depth at which the observations were made and the mean temperature of the air at the various stations, are given in the table below. The highest water temperatures, 86° 5 and 81° 3 were reported from Key West, Florida, and Savannah Georgia, and occurred on the 21st and 25th respectively, the lowest, 32° 9 occurred at Buffalo, New York, on the 2d. The smallest monthly range, 2° 9 occurred at Eastport, Maine; the greatest, 24° 1, occurred at Buffalo, New York. Observations were interrupted by ice at Duluth, Minnesota from the 1st to 11th, and at Marquette, Michigan on the 5th. On account of breakage of instruments no observations were made at San Francisco, California and Fort Canby, Washington Territory, from the 1st to 15th.

Temperature of water for May, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	66.0	49.5	16.5	ft. 5	58.7
Alpena, Michigan.....	61.5	41.5	20.0	12	48.5
Augusta, Georgia.....	80.5	60.0	20.5	7	74.0
Baltimore, Maryland.....	68.5	57.4	11.1	9	64.8
Block Island, Rhode Island.....	56.0	44.9	11.1	8	55.0
Boston, Massachusetts.....	55.4	46.1	9.3	21	53.8
Buffalo, New York.....	57.0	32.9	24.1	10	52.1
Canby, Fort, Washington*.....	66.9	48.5	18.4	15	53.4
Cedar Keys, Florida.....	86.5	76.5	10.0	8	77.0
Charleston, South Carolina.....	80.2	68.7	11.5	42	74.8
Chicago, Illinois.....	55.8	46.3	9.5	8	56.7
Chincoteague, Virginia.....	76.9	56.7	20.2	4	61.7
Cleveland, Ohio.....	58.8	45.5	13.3	14	57.7
Detroit, Michigan.....	60.4	48.2	12.2	23	58.9
Delaware Breakwater, Delaware.....	67.0	48.7	18.3	9	60.0
Duluth, Minnesota.....	41.2	38.5	2.7	4	48.9
Eastport, Maine.....	40.2	37.3	2.9	15	46.5
Escauaba, Michigan.....	55.1	34.9	20.2	17	49.1
Galveston, Texas.....	82.0	71.4	10.6	12	75.9
Grand Haven, Michigan.....	66.2	57.0	9.2	19	55.1
Indianola, Texas.....	82.0	66.9	15.1	9	75.4
Jacksonville, Florida.....	84.9	75.4	9.5	18	76.5
Key West, Florida.....	87.7	79.2	8.5	17	80.9
Mackinaw City, Michigan.....	51.8	37.0	14.8	10	47.7
Macon, Fort, North Carolina.....	77.0	62.5	14.5	6	64.3
Marquette, Michigan.....	38.0	34.7	3.3	9	47.2
Milwaukee, Wisconsin.....	52.1	45.1	7.0	8	53.5
Mobile, Alabama.....	81.5	68.5	13.0	16	74.6
New Haven, Connecticut.....	62.2	49.2	13.0	15	55.9
New London, Connecticut.....	55.0	44.0	11.0	12	55.8
New York City.....	60.9	50.5	9.5	16	58.8
Norfolk, Virginia.....	75.4	61.6	13.8	16	68.1
Pensacola, Florida.....	77.3	71.1	6.2	17	74.2
Portland, Maine.....	50.9	42.5	8.4	16	53.9
Portland, Oregon.....	61.7	51.0	10.7	62	59.8
Sandusky, Ohio.....	65.0	54.0	11.0	11	59.6
Sandy Hook, New Jersey.....	56.8	47.3	9.5	1	58.9
San Francisco, California*.....	59.7	50.2	3.5	39	58.2
Savannah, Georgia.....	81.3	65.7	15.6	10	76.1
Smithville, North Carolina.....	78.0	66.8	11.2	11	71.5
Toledo, Ohio.....	69.2	56.2	13.0	12	59.8
Wilmington, North Carolina.....	77.6	62.8	14.8	19	71.5

* Reports incomplete; see text.

ATMOSPHERIC ELECTRICITY.

AUORAS.

The only auroral display of the month, observed at more than one place, was that which occurred during the early morning of the 1st; and it was only observed at a few of the more northerly stations between New Hampshire and Dakota, as will be seen from the following reports:

Mount Washington, New Hampshire: a faint auroral display was observed from 1.30 a. m. of the 1st until daylight; it consisted of indistinct streamers extending upward 50°; no arch was visible.

Boston, Massachusetts: from 2 a. m. until daylight of the 1st, was observed a very brilliant auroral display in the form of an arch with streamers of light red color. The arch extended over about 40° of the northern sky and to an altitude of 45°.